more reliable in service than the Bosch magnetos manufactured before the war, or than the latest examples found in captured German aeroplanes."

"It is thus not only on the field," adds Mr. Kellaway, "that we have beaten the Bosch." What is true of the magneto is equally true of the ignition-plug. In 1914 three firms were producing a yearly output of not more than 5000 plugs. By October 31, 1918, the yearly output of five firms had risen to 2,148,725, and they were being supplied, not only to our own Services, but also to our French, Italian, and American Allies.

The story of the influence of the war upon our glass industry, and especially upon the manufacture of scientific and optical glassware, is no less inspiriting. Germany has once more been beaten at Jena. But it will scarcely be credited that at the outbreak of war a considerable part of our artillery was equipped with gun-sights exclusively "made in Germany"—the dial sight No. 7 of Goerz. There is much that needs clearing up concerning the pre-war methods of the War Office, and surely this is a case in point. That we should have become dependent upon a potential enemy for so essential a piece of mechanism as a gun-sight is surely one of the most astonishing instances of departmental ineptitude that could be conceived. But it is reassuring to be told that the resourcefulness of our opticians has been equal to the nation's emergency. The British sight is described as "a beautiful and delicate piece of work, and its production in such numbers, and in a perfection which Germany never exceeded, is a triumph for British skill."

NOTES.

THE achievement in wireless telephony recorded in the daily Press during the past few days is by no means unique. It is reported that Mr. Daniels, Secretary of the U.S. Navy, successfully telephoned a wireless greeting to President Wilson on board the *George Washington* when the vessel was more than eight hundred miles out at sea. According to a paper presented before the American Institute of Electrical Engineers, wireless and wire telephone systems can be linked so that the human voice will perform one lap of its journey over wire and the next lap through the ether to its final destination, while the replying waves will travel the air waves first and then proceed on wire. The operation of transferring sound from wire to air can be accomplished by a device similar to the repeater now used in long-distance telephony. Latest developments in connection with the wireless telephone would suggest the latter as an excellent supplement of wire systems. As a rival, however, it has not yet reached the stage when its claims can be considered seriously, partly because of the lack of secrecy involved in its use.

PROCLAMATION is made that the unlicensed importation into the United Kingdom is prohibited of the following articles:—All derivatives of coal-tar generally known as intermediate products capable of being used or adapted for use as dyestuffs, or of being modified or further manufactured into dyestuffs. All direct cotton colours, all union colours, all acid wool colours, all chrome and mordant colours, all alizarine colours, all basic colours, all sulphide colours, all vat colours (including synthetic indigo), all oil, spirit, and wax colours, all lake colours, and any other synthetic colours, dyes, stains, colour acids, colour bases, colour lakes, leuco-acids, leuco-bases, whether in paste, powder, solution, or any other form.

THE municipality of Le Havre, by a resolution of September 11, 1918, established the Institut Océanographique du Havre and appropriated funds for its maintenance. This places on a secure and public foundation the institute and laboratory of the University of Caen at Le Havre, and it will be conducted by the same staff, to the efforts of which during the past few years this last success is due, namely, the director, Dr. A. Loir, medical officer of health; the head of the laboratory, Mr. H. Legangneux; and the superintendent of biological research, Mr. E. Peau. Daily observations on the temperature and condition of the water, and on its bacterial, planktonic, and general biotic content, will be recorded at three fixed points, with the co-operation of naval officers. Other observations will continually be made at the French and British naval stations in the port, by permission of the respective commanding officers. Results of scientific and practical importance have already been obtained, and will now increase in number and extent.

MR. R. C. J. SWINHOE, of Mandalay, has presented to the Geological Department of the British Museum a collection of red amber from Burma, sometimes known as burmite, which contains the remains of a remarkably interesting insect fauna. The material has been examined by Prof. T. D. A. Cockerell, who has published in *Psyche* and in the Annals of the Entomological Society of America the descriptions of thirty-one new species, five of which are types of new genera. Most of these were contained in a block of amber rather larger than a man's fist; this has been cut into slices about half an inch thick, and every one of them is crowded with insect remains. There are representatives of Hymenoptera, Hemiptera, Homoptera, Diptera, Trichoptera, Coleoptera, Termites, Acarina, and Diplopoda—in fact, ants are about the only kind of insect the absence of which is conspicuous. The amber occurs in clay beds of Miocene age, but it was washed into them from higher levels, and may be much older. This is certainly the most important addition made of recent years to the very large collection of insects in amber already preserved in the department. It is unfortunate that the deep colour of the amber renders it very difficult to exhibit the specimens so that their contents can be seen by the public.

IN many cities of the United States there are historical societies which have organised museums illustrating the history of the State or locality, but there is no central museum of national history. So, too, there are many museums of art, well known for their treasures and their enterprise, but such collections as pertain to the National Gallery of Art are provisionally housed in one of the halls of the Natural History Museum. It is, therefore, good news that on January 29 a Bill was introduced by Congressman Hicks in the House of Representatives to provide for a national museum of history and the arts, and it was a happy thought of his to propose such an institution as a memorial to Theodore Roosevelt. The idea is one that would have commended itself to that wide-reaching, enthusiastic, and patriotic spirit, for it is intended to assemble and display, not merely relics illustrating the personal and political history of the United States, but also such objects as will elucidate all the cultural development of the nation. Thus the museum will comprise, in addition to the collections of fine art and the national portraits, exhibits elucidating the evolution of all the arts and crafts and their application to all branches of human activity. The same applies to the application of science to the industries and the exploitation of the natural resources of the country—a subject in which Mr. Roosevelt took a profound and practical interest. It is proposed that the building shall be erected in Washington. We wish the scheme all success.

SUMMER time will be brought into force this year on the morning of Sunday, March 30, and will continue until the night of Sunday-Monday, September 28–29.

WE announce with much regret the death on February 19, at eighty-five years of age, of Dr. F. Du Cane Godman, F.R.S., trustee of the British Museum, and distinguished for his work in natural history, especially ornithology.

WE notice with regret the announcement of the death, in his fifty-seventh year, of Lt.-Col. A. M. Paterson, professor of anatomy in the University of Liverpool since 1894, and ex-president of the Anatomical Society of Great Britain and Ireland.

THE Linen Industry Research Association of Belfast is about to appoint a director of research at a salary of not less than 1000*l.* per year. The selected candidate will be expected to make a survey of the entire field of research in the linen industry, to draft a programme of research, and to organise and supervise the carrying out of the scheme.

DR. T. A. HENRY, superintendent of the laboratories at the Imperial Institute, London, has been appointed director of the Wellcome Chemical Research Laboratories, London. Dr. F. L. Pyman, the former director of these laboratories, has accepted the professorship of technological chemistry in the College of Technology, University of Manchester.

IT is intended to hold a discussion on "Metrology in the Industries" at the meeting of the Physical Society on Friday, March 28, at the Imperial College of Science, South Kensington. Sir R. T. Glazebrook, Director of the National Physical Laboratory, has promised to introduce the discussion, and it is expected that several of the leading authorities on fine measurements will take part.

THE fifth lecture of the series arranged by the Industrial Reconstruction Council will be held in the Saddlers' Hall, Cheapside, E.C.2, on Wednesday, March 5. The chair will be taken at 4.30 by Sir George Riddell, Bart., and a lecture entitled "Industrial Changes Caused by the War" will be delivered by Prof. A. W. Kirkaldy, University of Birmingham. Applications for tickets should be made to the Secretary, Industrial Reconstruction Council, 2 and 4 Tudor Street, E.C.4.

NEXT Tuesday, March 4, Prof. H. Maxwell Lefroy will deliver a lecture at the Royal Institution on how silk is grown and made—mulberry silk, and on March 11 on insect problems. The Friday evening discourse on March 7 will be delivered by Prof. H. C. H. Carpenter on the hardening of steel; on March 14, Prof. A. Keith on the organ of hearing from a new point of view. On Saturday, March 8, Sir J. J. Thomson will give the first of a course of six lectures on spectrum analysis and its application to atomic structure. Prof. Hele-Shaw's lectures on "Clutches," announced for March 4 and 11, are unavoidably postponed until after Easter.

WE regret to record the death of Mr. Henry Bell Wortley on February 17. An account of his career appears in the *Engineer* for February 21. Mr. Wortley was a member of the firm of steamship owners, Alfred Holt and Co., of Liverpool, and was fifty-one years of age at his death. He was trained as a naval architect with various firms on the Tyne, and after joining the Liverpool firm he was responsible for new features in the design of many ships belonging to the Holt Co. Mr. Wortley was a member of the Institution of Civil Engineers and the Institution of Naval Architects. During the war he took an active part in placing Liverpool in the forefront as a munition-producing area.

THE next ordinary scientific meeting of the Chemical Society will be held at Burlington House on Thursday, March 6, at 8 p.m., when Prof. J. W. Nicholson will deliver a lecture entitled "Emission Spectra and Atomic Structure." It was announced at the meeting held on February 20 that the following changes in the list of officers and council had been proposed by the council:—*President:* Sir James J. Dobbie. New *Vice-Presidents:* Dr. H. J. H. Fenton and Prof. James Walker. New *Ordinary Members of Council:* Mr. J. A. Gardner, Prof. F. E. Francis, Dr. C. A. Keane, and Sir Robert Robertson. The anniversary dinner of the society will be held in the Connaught Rooms, Great Queen Street, W.C.2, on Thursday, March 27, at 6.45 for 7 o'clock.

WE extract from the *Lancet* the following obituary notice of Prof. R. Blanchard, who died on February 8 at sixty-one years of age. Prof. Blanchard had occupied for long the chair of parasitology at the faculty of medicine in Paris, and his great reputation in France and abroad was due to his works on medical zoology, and particularly to his researches on the animal carriers of pathogenic germs and their *rôle* in the propagation of epidemics. The "Traité de Zoologie Médicale," in two volumes, first appeared in 1886–90. At the time of his death he was engaged on the great task of a history of medicine, and had made some progress in the publication of a *corpus inscriptionum* devoted to medicine and biology. His diligence was incredible. Prof. Blanchard was secretary to the Academy of Medicine, and he founded the French Society for the History of Medicine, the Colonial Institute of Medicine, and the French Congress of Zoology. For twenty years he acted as general secretary to the Zoological Society of France. Owing to the part which he took at several of the International Congresses of Medicine he became a well-known figure abroad.

MATHEMATICIANS and astronomers will learn with much regret that news has been received through a correspondent in Stockholm announcing the death of Alexander Michailovitch Liapounoff. He is said to have died at Odessa by his own hand as a result of the Bolshevist *régime*, but we have no means of confirming the report. Liapounoff held the chair of applied mathematics in the Petrograd Academy. His more important papers were published mainly in the Memoirs of the Academy and in Liouville's Journal. Unfortunately for English readers, a number were written in Russian, only summaries and abstracts appearing in French. His earlier work lay in the direction of broad, general theorems in hydrodynamics and the theory of gravitating masses. His later, and perhaps best-known, work dealt with the stability of the pear-shaped figure of a rotating mass of liquid, a problem of the first importance to theories of cosmogony. Poincaré had developed a method for the analytical discussion of the problem in 1901, but did not carry out the necessary calculations in detail, and so reached no definite conclusion. In 1902 Sir G. Darwin announced that he had proved the pear-shaped figure to be stable, but this announcement was followed by a paper from Liapounoff in 1905, in which it was claimed that the pear-shaped figure was unstable. Liapounoff's work was distinguished by the combination of clear physical insight and masterly analytical skill.

INFLUENZA has again further increased in severity over the British Isles, and the Registrar-General's return for the week ending February 15 shows the deaths in London (County) to be 273 due to the epidemic. Forty-eight per cent. of the deaths occurred at the ages from twenty to forty-five, so that the death incidence is similar to that when the present epidemic was most virulent at the commencement of last November, the complaint attacking most severely the strong and able-bodied. Influenza caused 13 per cent. of the total deaths during the week ending February 15, pneumonia 13 per cent., and bronchitis 16 per cent.; in the early part of November influenza caused 57 per cent. of the deaths from all causes, but deaths from pneumonia and bronchitis were not very different from those at present. In the ninety-six great towns of England and Wales, including London, there were 1363 deaths during the week from influenza, and since the commencement of the epidemic in October last there have been 48,736 deaths, whilst in London there have been 12,286 deaths. The total deaths in any previous epidemic in London have only amounted to about 2000. The present is the twentieth week of the epidemic, five of the previous epidemics having continued as long, and the epidemic from October 1904 to April 1905 continued for twenty-six weeks, but in London during the whole time the total deaths from influenza were only 707, and the maximum number in any week was only forty-five.

AN interesting note is contributed to the German weekly scientific paper, *Die Umschau*, for November 30, 1918, by the editor, Prof. J. H. Bechhold. Prof. Bechhold indicates the manner in which German science can aid the Fatherland in its hour of defeat and assist it to gain the supremacy in the economic sphere. After pointing out that reconstructed Germany must perforce be simple in order to conform to the new conditions of life imposed upon her by recent events, he asks the question: In what relation shall science, technics, and art stand in the new State? Germany, it is explained, must in future seek to live upon her own resources; further, she will have only a small amount of raw material surplus to her own needs, and for this reason it will be incumbent upon her to export the output of her genius; to meet the situation as it should be met, Germany will have to build herself up on efficiency management. She is told that she must attempt to excel all other countries in the quality of her precision instruments and lenses, artificial silks and textiles, dyes and medicines, high-class furniture and works of art, in order to create a demand for these valuable products of her industry in foreign lands. For this reason, Germany will require, says Prof. Bechhold, highly trained engineers, chemists, electricians, skilled mechanics and artificers, and, in order that her needs in these directions may be suitably met, she will further require first-class teachers, first-class training institutions and research laboratories, as well as colleges. These matters are, it is stated, of such overwhelming importance that they must not be permitted to become a class or caste question; there is little danger of this at the present time, for already the intellectual men in Germany are combining forces in various directions: this is so in the case of the technical man and the academician, as well as in that of the artificer and the university professor. Finally, an inventors' institute must be founded in order that the inventor may be furnished with advice, the commercial possibilities of his work tested, a selection made of what is best, and a good market found for that which is of real worth. Prof. Bechhold evidently intends that German science shall make a mighty effort in order that Germany in defeat may prove herself as formidable in the economic sphere in the future as ever she was before her great downfall.

MR. ARTHUR L. LEACH has published an account of the prehistoric remains in the museum at Tenby. An interesting series of adinole and flint implements was acquired from the Hoyle Cave. Mr. Leach maintains that the relics found in the caves on Caldey Island prove that it was connected with the mainland when the mammoth, rhinoceros, and reindeer were the characteristic fauna of this region, a connection which lasted until Neolithic times. The collection includes many later remains of the Bronze and Romano-British periods. A little rock-shelter, Nanna's Cave, in the Isle of Caldey, the earliest inhabited site which can be approximately dated, was occupied between about 250 and 400 A.D.

THE measures for the reformation of the numerous wandering criminal tribes which pervade northern India, and are a serious menace to the cultivating classes, have long engaged the attention of the Government. A fairly satisfactory report of the establishment of a reformatory settlement at Amritsar, in the Punjab, has recently been published. The mortality among these people, accustomed to eat carrion and food cooked in an unwholesome way, has been excessive. On their arrival at Amritsar much dismay was caused among them by the discovery that a gallows still stood in one of the jail yards. But they soon became reconciled to their new environment, and many of the younger members have shown an unexpected aptitude for industrial work in the woollen mills. The only remedy is to intern these pests of Indian society, and the experience of the Amritsar settlement shows that, under judicious, kindly officials, the younger members at least of the gangs may be trained to abandon their criminal nomadic life, and accustom themselves to industry.

MR. T. A. JOYCE describes in the January issue of *Man* a remarkable wooden stool recently acquired by the British Museum from the island of Eleuthera, Bahamas. Objects of wood from the West Indies are by no means common, and specimens from the Bahamas are exceedingly rare. From one of the shorter sides of the seat of this chair projects a knob, which has been carved to represent a grotesque human head, of which the eyes and mouth have evidently at some time been emphasised by inlay, probably of shell. These State chairs were used for a honorific purpose, for chiefs and other distinguished persons. A compliment of this kind was paid to a party sent by Columbus to visit a Cuban prince. The Museum already possesses examples of wooden objects of Taiman workmanship of very great importance, including a stool from Cuba of very unusual type. The new specimen is an interesting and important addition to the collection.

IN the course of some "Notes on Birds Observed near Dunkerque," published in *British Birds* for February, Mr. H. F. Witherby makes some extremely interesting observations on the nesting habits of the Kentish and little ringed plovers. The former species, he remarks, has a habit of embedding its eggs in the sand whenever they have to be left unguarded, no more than the broad end being exposed to view. During incubation they are brought to the surface again. The actual hatching time for the eggs of the little ringed plover—that is to say, the time taken from the "chipping" of the shell to the complete emergence of the chick—is not, apparently, less than forty-eight hours. The downy nestlings of these two species are readily distinguished by their markings, yet, when the chick of one species is substituted for that of the other, the parents do not seem to realise that such an exchange has been made.

Proposals are on foot to develop and utilise the water-power resources of Iceland. In an article on the subject in *La Géographie* (vol. xxxii., No. 3) M. Rabot points out that the waterfalls of the island could provide at least 4,000,000 h.p. An Icelandic-Norwegian company proposes to harness the Thorsa, the longest river in Iceland, on which there are at least six splendid falls available for industrial purposes. The Thorsa could provide 800,000 h.p. for five months of the year, and not less than 1,100,000 h.p. for the rest of the year; the largest fall could furnish 500,000 h.p. for seven months. It is proposed to use this power in the manufacture of nitrates and sulphates of ammonia. A further project is attracting the attention of the Danish East Asiatic Co. It proposes to carry wheat from Port Nelson, on Hudson Bay, to Iceland, and there to utilise the power of the Thorsa River in milling it preparatory to export to Europe. Despite the abundance of water-power, Iceland presents certain disadvantages in its development as an industrial country. The frequency of earthquakes, not to mention eruptions of lava, may interfere with mechanical installations. Glacial floods, which are frequent and violent, may also cause difficulties. Lastly, the labour question will have to be solved, for Iceland has not sufficient labour to meet the demands of industrial development.

Meteorological Office Circulars Nos. 31 and 32, to February 1, issued monthly, show that a climatological station has been established at Keswick, and observations will be used for the Monthly Weather Report from January. A climatological station has also been established at Strathpeffer, Ross-shire, so that, after a break of about eighteen months, this northern spa is again represented in the Monthly Weather Report. There is the gratifying information of a Rainfall Association for Munster. Much need for additional rain information for Ireland has been felt, especially with the prospect of forestry and water-power. There is promise of "the analysis of wind records at Southport"; this discussion by Mr. J. Baxendell uses twenty years' observations. Advance copies of a "Manual of Meteorology," part iv., are available for official use. It gives "The Relation of the Wind to the Distribution of Barometric Pressure," by Sir Napier Shaw. It is stated that "it represents the progress made chiefly by those who have been associated in the work of the Meteorological Office in the past twenty years." Circular No. 32 contains a scale of surface visibility as adopted by the Meteorological Office, the Admiralty Meteorological Service, Meteorological Service Royal Air Force, and the French Army Meteorological Service. The scale 0 to 8 is given in metres and in miles at which objects are not visible in good daylight, 0 not beyond 200 metres, and 8 not beyond 30,000 metres or 18·6 miles.

In the *Revue générale des Sciences* for January 15, Prof. F. M. Jaeger, of the University of Groningen, gives a *résumé* of the results which have been obtained in his laboratory during the last five years on the chemico-physical properties of substances at high temperatures. The surface tensions of organic liquids have been determined up to about 200° C., and of fused salts up to 1600° C., by the submerged bubble method. While the surface tensions of organic liquids diminish rapidly with increase of temperature, those of fused salts change very little. The electrical conductivities of the fused salts have also been determined up to 1600° C. in some cases. All the salts investigated have conductivities which increase with temperature according to a linear law.

A series of articles has appeared dealing with the radiation-characteristics of the incandescent mantle, being chiefly an extension of the work of Rubens on the thoria-ceria mixtures to a large family of such combinations. It exhibits the Welsbach mantle (Journal of the Franklin Institute, November, 1918) simply as one of a group of possible combinations of radiating materials. The closest study has been made of the behaviour under various conditions of the absorption bands to which the enhanced visible radiation of the more efficient mantles is due. No explanation has been found for the occurrence of the visible absorption bands of ceria and other materials, but the information obtained as to the conditions under which they appear and disappear has made possible a fairly complete explanation of the different behaviour of the mantle in flame and cathode-discharge heating.

In two papers published in the Proceedings of the Tokyo Mathematico-Physical Society (ser. 2, vol. ix., October, 1918) Mr. Keiichi Aichi makes an interesting contribution to the hydrodynamical theory of density or temperature seiches. By developing Love and Rayleigh's treatment of oscillations in a fluid of variable density, he arrives at an expression for the period of internal seiches in a basin of uniform depth with vertical sides, in which two layers of uniform, but different, density are separated by a transition layer in which the density varies exponentially. Lakes of rectangular or circular shape alone are considered. The interest of such a discussion is mathematical rather than physical, as the theory takes no account of shelving shores or irregularity of shape. Therefore, for comparison of observed with computed periods it is as satisfactory to assume the simple case of a sharp discontinuity of density with uniform density above and below the boundary. Chrystal's treatment of the problem, as developed by Dr. E. M. Wedderburn, though less rigid mathematically, affords a safer method of comparison, as all the peculiarities of the shape of the lake basin are taken into account, and it is unnecessary to assume any arbitrary law for the variation of density. Taking the case of Loch Earn in August, 1911 and 1913, temperature seiches with periods of 15·2 hours and 19·5 hours respectively were observed. The corresponding periods computed by Dr. Wedderburn were 15·0 and 19·6 hours. Mr. Aichi, using the same data and employing his method of calculation, obtains periods of 17 and 16 hours. The papers conclude with some remarks on the possibility of internal seiches in the ocean, and it is shown that in a tropical sea, 3 km. deep and 1000 km. long, internal seiches with periods of from 3 to 4 days may be expected.

An illustrated article in *Engineering* for January 31 gives particulars of the double-reduction geared turbines made by the Parsons Marine Steam Turbine Co., Wallsend-on-Tyne, for single-screw standard vessels. There is one high-pressure and one low-pressure turbine working in series. The high-pressure turbine is of the impulse type, and coupled by means of flexible couplings and pinion to the starboard first reduction wheel. The low-pressure turbine is of the reaction type, and coupled in a similar manner to the port first reduction wheel. The first reduction wheels are mounted on pinion shafts working into the second reduction wheel, which is connected direct to the thrust shaft with a thrust block of the pivoted type. The total shaft horse-power of the installation is 2900; the speed of the propeller is 78 revolutions per minute, and each turbine has a speed of 3500 revolutions per minute. The gearing is arranged to give the following ratios:—From turbines to first reduction wheel, 7·9 to 1; from first reduction gearing to second reduction wheel, 5·7 to 1; and the total reduction ratio is 45 to 1. The wheels and pinions are of the usual double-helical type; the first reduction wheels are made of cast-iron with wrought-steel tyres shrunk on; the second reduction wheels are of cast-iron with cast-steel tyres shrunk on; all four pinions are of nickel steel. The axial pitches of the teeth in the first and second reduction gearing are 7/12 in. and 1 in. respectively; the angle of helix is 30°.

THE January, 1919, issue of the quarterly classified list of second-hand instruments for sale or hire published by Mr. C. Baker, 244 High Holborn, W.C.1, has been received. Several new pieces of apparatus, which Mr. Baker can still supply, are included in the list and are suitably distinguished. Readers who may require microscopes, surveying instruments, telescopes, spectroscopic apparatus, or physical apparatus of a general kind should examine this comprehensive catalogue.

OUR ASTRONOMICAL COLUMN.

COMETS.—M. Fayet has calculated the following extended ephemeris of Borrelly's comet for Greenwich midnight; it should be observable with powerful instruments for two or three months:—

		R.A.			N. Decl.		Log r	Log Δ
		h.	m.	s.	°	′		
March	2	7	9	33	63	56		
	6	7	17	51	63	17	0·26483	0·09827
	10	7	26	25	62	34		
	14	7	35	13	61	49	0·27717	0·13347
	18	7	44	7	61	1		
	22	7	53	3	60	10	0·28939	0·16706
	26	8	1	59	59	17		
	30	8	10	54	58	22	0·30146	0·19918
April	3	8	19	46	57	26		
	7	8	28	31	56	28	0·31333	0·22992
	11	8	37	11	55	28		
	15	8	45	42	54	28	0·32496	0·25932
	19	8	54	6	53	26		
	23	9	2	21	52	24	0·33635	0·28748
	27	9	10	29	51	21		
May	1	9	18	29	50	18	0·34748	0·31443
	5	9	26	22	49	14		
	9	9	34	4	48	10	0·35834	0·34020

Lick Observatory Bulletin No. 320 contains an elliptical orbit of comet 1918*d* (Schorr) calculated by Mr. H. M. Jeffers from observations on November 25 and December 3 and 7, 1918:—

$$T = 1918 \text{ Oct. } 16{\cdot}442 \text{ G.M.T.}$$

$$\left.\begin{aligned} \omega &= 285^\circ\ 37'\ \ 0'' \\ \Omega &= 118^\circ\ 32'\ 38'' \\ i &= \ \ 5^\circ\ 19'\ 58'' \end{aligned}\right\} 1918{\cdot}0$$

$$\begin{aligned} \phi &= 25^\circ\ 35'\ 14'' \\ \log a &= 0{\cdot}512136 \\ \mu &= 605{\cdot}066'' \\ \text{Period} &= 5{\cdot}8641 \text{ years} \end{aligned}$$

The time of perihelion is decidedly later, and the period shorter, than in the Copenhagen orbit.

"ANNUAIRE" OF THE BUREAU DES LONGITUDES.—This most useful little annual is so widely known that it is unnecessary to give an account of its main features. The essays vary from year to year; those in the present volume are: (1) The figures of relative equilibrium of a rotating homogeneous liquid, by P. Appell, and (2) The determination by interference of the diameters of heavenly bodies, by Maurice Hamy. (1) Treats the subject from an historical point of view, beginning with MacLaurin's ellipsoids of revolution, going on to those of Jacobi, with three unequal axes, then the tracing of the connection between these two classes and the investigation of the points of bifurcation; this leads on to the alternate direction of possible bifurcation, namely, the pear-shaped figures investigated by Liapounoff and Poincaré, many of which are illustrated in the text. Finally, the question of stability is dealt with, and the remarkable property of its interchange from one class of figures to another at the points of bifurcation. There is a very full bibliography. (2) Shows how the real diameters of such bodies as satellites and minor planets may be inferred from a study of their interference fringes. The following determinations (reduced to distance unity) are given as specimens:—Io, 4·90″; Europa, 4·35″; Ganymede, 6·40″; Callisto, 6·55″; and Vesta, 0·54″, or 250 miles. The author considers that with the Mount Wilson 100-in. reflector it might be possible to determine the angular diameters of 1st magnitude stars.

THE CHEMICAL DETECTION OF STRAIN IN IRON AND STEEL.

THE ninth volume of the Carnegie Scholarship Memoirs of the Iron and Steel Institute contains an account of an investigation on the above subject by Messrs. Whiteley and Hallimond, of the South Durham Steel and Iron Co. The research arose out of an observation made in the course of experiments in connection with the Eggertz test for combined carbon made by one of the authors. On examining the composition of the gases evolved when samples of steel were dissolved in dilute nitric acid, the authors noticed that the nitrous gases given off differed considerably in their proportions in the case of different samples. They were at first inclined to think that these variations were due to the influence of other elements, such as carbon and phosphorus, which are always present in steels. Later work, however, showed that the chief cause of the variations was the particular mechanical treatment to which the different samples have been subjected.

The paper is divided into two parts In the first the authors discuss in some detail the chemical reactions involved, and the analyses of the gases formed when iron is dissolved in nitric acid. In the second they describe the changes in the reaction produced by mechanical work on various iron and steel samples, and show how the effect can be used to measure the progressive removal of cold work on annealing.

The reaction between nitric acid and various metals has been the subject of numerous investigations, among which may be mentioned those of Veley, Divers, Montemartini, and Stansbie. These researches deal mainly with copper, while iron has received much less attention. The authors point out that a variety of reduction products is obtained by the solution of metals in nitric acid. Nitrogen peroxide, nitric and nitrous oxides, nitrogen, ammonia, hydroxylamine, hydrogen, and hydrazine have all been obtained in pro-